

REMARKS

Claims 1-6, 8-19 and 21-61 are pending in the above-captioned patent application after this amendment. Claims 1-19 and 21-61 have been rejected.

The Applicants respectfully disagree with the rejection of claims 1-19 and 21-61. However, the Applicants have amended claims 1, 33, 43, 49, 50, 55 and 56, and cancelled claim 7 without prejudice with this amendment for the purpose of expediting the patent application process in a manner consistent with the goals of the Patent Office (65 Fed. Reg. 54603), and/or to clarify what the Applicants regard as the present invention.

Support for the amendments to claims 1, 33, 43, 49, 50, 55 and 56 can be found throughout the originally filed specification. In particular, support for the amendments to claims 1, 33, 43, 49, 50, 55 and 56 can be found in the specification at page 12, line 21 through page 14, line 10, at page 14, lines 22-26, at page 18, lines 15-33, at page 23, line 22 through page 24, line 16, in Figures 2A, 3, 10A and 10B, and in the originally filed claims. Further, claim 1 has been amended to include the limitations of claim 7.

No new matter is believed to have been added by this amendment. Reconsideration of the pending application is respectfully requested.

Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 49 and 55 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. More particularly, the Examiner asserts that claims 49 and 55 are purported to be a method of making a wafer, but there are no steps defined to make the method.

In response, the Applicants have amended claims 49 and 55 to provide active steps for the methods of making a wafer being claimed. Accordingly, the Applicants respectfully submit that the rejection of claims 49 and 55 has been overcome, and the Applicants respectfully request that the rejection of claims 49 and 55 under 35 U.S.C. § 112, second paragraph, be withdrawn.

Rejections Under 35 U.S.C. § 103(a)

Claims 1-10, 16-25, 30-33, 37-46, 48 and 56-61

Claims 1-10, 16-25, 30-33, 37-46, 48 and 56-61 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,757,160 issued to Kreuzer ("Kreuzer"). The Applicants respectfully suggest that the Examiner did not intend to reject claims 33 and 37-42 under 35 U.S.C. § 103(a) as being unpatentable over Kreuzer, as Kreuzer does not disclose a shield as is claimed in claims 33 and 37-42. Accordingly, the Applicants will address the rejection of claims 33 and 37-42 later in this Amendment and Response as if the Examiner had rejected claims 33 and 37-42 over the combination of references as cited below. Additionally, the Applicants respectfully suggest that the Examiner did not intend to reject claim 20 herein as it had been canceled in a previous Amendment and Response. Further, the Applicants respectfully submit that the rejection of claims 1, 43 and 56, as amended, is unsupported by the art and should be withdrawn. Still further, the Applicants respectfully traverse the rejection of claims 19, 21-25 and 30-32 and respectfully submit that the rejection of claims 19, 21-25 and 30-32 is unsupported by the art and should be withdrawn.

More particularly, the Examiner contends Kreuzer discloses a measurement system comprising a laser source 34; a first path 37; a penta-prism 36 that redirects the beam at a 90° angle to the first path; and a reflector 32 that is arranged as claimed and directs the beam back to the penta-prism, wherein the measurement system is less sensitive to rotation about a third angle. The Examiner concedes that Kreuzer uses only one source to measure the plurality of displacement along plural axes, and that Kreuzer does not disclose the calculating of the position or displacement, but the Examiner contends that one of ordinary skill in the art would know and understand how to overcome these differences.

The Applicants provide that Kreuzer is directed to a measurement system comprising a laser 34 that emits a light beam 37; a penta-prism 36; a penta-prism beamsplitter 22; a penta-prism beamsplitter 24; a beamsplitter 26; a fold mirror 28; interferometer laser gauges 14, 16; and return mirrors 30, 32. During operation, the laser 34 emits the light beam 37, most of which is directed to the penta-prism 36, which in turn redirects the light to penta-prism beamsplitter 22. The penta-prism beamsplitter 22

permits a portion of the light to continue to penta-prism beamsplitter 24 and directs a portion of the light perpendicularly toward adjacent interferometer laser gauge 16, wherein the light that enters the interferometer laser gauge 16 is directed to and reflected from the return mirror 32. The light entering penta-prism beamsplitter 24 is similarly split, with a portion being directed to interferometer laser gauge 16, which also uses return mirror 32, and a portion being directed to beamsplitter 26. A portion of the light entering beamsplitter 26 is directed to the adjacent interferometer laser gauge 14, from which the light is directed to and reflected from the return mirror 30, and another portion is directed to the fold mirror 28. The fold mirror 28 directs the light to the adjacent interferometer laser gauge 14, which also uses return mirror 30. Additionally, each interferometer laser gauge 14, 16 has an output 18, which is carried to a photodetector by a fiber optic cable 20. (Kreuzer column 2, lines 37-52, column 3, line 64 through column 5, line 7, column 5, lines 34-39, and Figure 1).

However, Kreuzer does not disclose a measurement system including a first beam on a first path and a first redirector that redirects substantially all of the first beam on a first redirected path that is 90 degrees from the first path. In Kreuzer, only a portion of the light that is directed to penta-prism beamsplitter 22 is redirected at approximately 90 degrees toward the interferometer laser gauge 16, whereas another portion of the light is allowed to continue toward subsequent penta-prism beamsplitter 24 and beamsplitter 26. With the light continuing through penta-prism beamsplitter 22 being subjected to up to two more splits, substantially all of the first beam is not redirected 90 degrees from the first path with the penta-prism beamsplitter 22.

Additionally, Kreuzer also does not disclose a measurement system including a first system that measures the sum of the position of the stage along the first axis and along the second axis. Kreuzer employs four individual interferometer laser gauges 14, 16 to provide measurements of displacement of the stage along the first axis and along the second axis. Two of the interferometer laser gauges 16 individually measure the displacement of the stage along the first axis, and two of the interferometer laser gauges 14 individually measure the displacement of the stage along the second axis. With each individual interferometer laser gauge 14, 16 measuring displacement of the stage along a single axis, there is clearly no teaching of having a system that measures

the sum of the position of the stage along the first axis and along the second axis.

Further, Kreuzer does not disclose a measurement system including a first redirector that redirects the first beam on a first redirected path toward a reflector, wherein the reflector reflects the first beam back at the first redirector before the first redirector redirects the first beam on a second redirected path that is parallel with the second axis; and a first detector that is positioned away from the stage to detect the first beam after the first beam has been redirected on the second redirected path by the first redirector. Kreuzer uses interferometer laser gauges 14, 16 that are mounted on the stage to detect the light that has been reflected from the return mirrors 30, 32, and the interferometer laser gauges 14, 16 do not detect the light after it has been redirected on a second redirected path that is parallel with the first path.

In distinction to Kreuzer, amended claim 1 recites “(a) measurement system for measuring the position of a stage, the measurement system comprising: a first system comprising a first beam source that directs a first beam on a first path and a first redirector that is secured to the stage, the first redirector redirecting substantially all of the first beam so that the redirected first beam is on a first redirected path that is 90 degrees from the first path even if the first redirector is rotated a small angle about an axis; wherein the first redirected path is parallel with a first axis, the first path is parallel with a second axis, and the first system measures the sum of the position of the stage along the first axis and along the second axis.” Because Kreuzer does not teach or suggest all of the elements of amended claim 1, the § 103(a) rejection is unsupported by the art and should be withdrawn. Further, because claims 2-6, 8-10 and 16-18 depend either directly or indirectly from amended claim 1, the rejection of claims 2-6, 8-10 and 16-18 is also unsupported by the art and should be withdrawn.

Additionally, in distinction to Kreuzer, claim 19 recites “(a) measurement system ... comprising: a first system comprising a first beam source that directs a first beam on a first path that is parallel to a second axis; and a first redirector secured to the stage, the first redirector redirecting the first beam so that the redirected first beam is on a first redirected path that is parallel to the first axis, wherein the first system measures the sum of the position of the stage along the first axis and along the second axis.”

Because Kreuzer does not teach or suggest all of the elements of claim 19, the §

103(a) rejection is unsupported by the art and should be withdrawn. Further, because claims 21-25 and 30-32 depend either directly or indirectly from claim 19, the rejection of claims 21-25 and 30-32 is also unsupported by the art and should be withdrawn.

Further, in distinction to Kreuzer, amended claim 43 recites “(a) method for measuring the position of a stage ... comprising the steps of: directing a beam on a first path with a beam source; and redirecting the beam with a redirector that is secured to the stage, the redirector redirecting substantially all of the beam so that the redirected beam is on a redirected path that is 90° from the first path even if the redirector is rotated approximately 0.1° about an axis.”

Because Kreuzer does not teach or suggest all of the elements of amended claim 43, the § 103(a) rejection is unsupported by the art and should be withdrawn. Further, because claims 44-46 and 48 depend either directly or indirectly from amended claim 43, the rejection of claims 44-46 and 48 is also unsupported by the art and should be withdrawn.

Yet further, in distinction to Kreuzer, amended claim 56 recites “(a) measurement system ... comprising: a first system having a first redirector that is secured to the stage, the first system directing a first beam to the first redirector on a first path that is parallel with a second axis, and the first redirector redirecting the first beam on a first redirected path that is parallel with the first axis; a reflector that is positioned away from the stage, the first reflector extending along the second axis; wherein the first redirector redirects the first beam at the reflector and the reflector reflects the first beam back at the first redirector, and the first redirector redirects the first beam on a second redirected path that is parallel with the second axis; and wherein the first redirector is configured to be insensitive to the rotation around a third axis that is orthogonal to the first and second axes about the direction redirecting the first beam from the first path; and a first detector that is positioned away from the stage, the first detector detecting the first beam after the first beam has been redirected on the second redirected path by the first redirector.”

Because Kreuzer does not teach or suggest all of the elements of amended claim 56, the § 103(a) rejection is unsupported by the art and should be withdrawn. Further, because claims 57-61 depend either directly or indirectly from amended claim 56, the

rejection of claims 57-61 is also unsupported by the art and should be withdrawn.

Claims 11-15, 26-29, 34-36, 47 and 50-54

Claims 11-15, 26-29, 34-36, 47 and 50-54 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kreuzer in view of U.S. Patent No. 5,469,260 issued to Takagi et al. ("Takagi et al."). As noted above, the Applicants respectfully suggest that the Examiner intended to reject claims 33 and 37-42 as well under this combination of references. Additionally, the Applicants respectfully submit that the rejection of claims 33 and 50, as amended, is unsupported by the art and should be withdrawn.

More particularly, the Examiner concedes that Kreuzer does not disclose a shield to cover the measuring light beam. However, the Examiner contends that Takagi et al. teaches attaching to the substrate stage a cover or shield (10y, 12y, 30y, 31y, 40y) for the measuring light beam to prevent temperature variation from causing an inaccurate measurement.

The Applicants provide that Takagi et al. is directed to, in relevant part, a measurement system including laser interferometers IFMy and IFMx for detecting displacement of the stage WST along the Y axis and the X axis, wherein the optical path of beams B2y and B2x for reference is covered by prismatic fixed covers 10y and 10x, and wherein the optical path of beams B1y and B1x for measurement is covered by prismatic movable covers 12y and 12x and outer cover portions 11y and 11x. Temperature-controlled clean air is then provided within the respective covers in order to control the environment around the respective beams. In a second embodiment, the measurement system employs similar process for protecting the beams including first movable covers 30x and 30y and second movable covers 31x and 31y that link the first movable covers 30x and 30y to outer covers 11x and 11y. A third embodiment employs the use of short movable covers 40y and 40x provided under fixed covers 10y and 10x, and openable-closable covers 41Y-1 through 41Y-7 provided around the movable cover 41y. (Takagi et al. column 6, line 16 through column 7, line 35, column 7, lines 57-66, column 8, line 54 through column 9, line 49, and in Figures 1, 3 and 4).

However, Takagi et al. does not disclose a measurement system including a shield that is positioned near at least a portion of the stage mover assembly and that is adjacent to a path of the beam so that the shield inhibits environmental conditions from

influencing the beam. The various covers employed in these different embodiments typically extend away from the wafer stage WST and cover much if not all of the path of the beams. However, nowhere does Takagi et al. teach the positioning of the covers near at least a portion of the stage mover assembly. Takagi et al. utilizes temperature-controlled clean air supplied within each of the covers to control the environmental conditions, not a strategically positioned cover or shield to inhibit environmental conditions from influencing the beams.

As noted above, the rejection of amended claim 1 is unsupported by the art. Therefore, amended claim 1 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claims 11-15, which indirectly depend from amended claim 1, are patentably distinguishable over the cited combination of references.

Additionally, as noted above, the rejection of amended claim 19 is unsupported by the art. Therefore, amended claim 19 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claims 26-29, which indirectly depend from amended claim 19, are patentably distinguishable over the cited combination of references.

Further, in distinction to the cited combination of references, amended claim 33 recites "(a) combination ... comprising: a stage that retains the device; a stage mover assembly that moves the stage; and a measurement system for measuring the position of the stage, the measurement system comprising a first system including a first beam source that directs a beam at the stage and a shield positioned near at least a portion of the stage mover assembly and adjacent to a path of the beam so that the shield inhibits environmental conditions from influencing the beam."

Because the cited combination of references does not teach or suggest all of the elements of amended claim 33, the § 103(a) rejection is unsupported by the art and should be withdrawn. Further, because claims 34-42 depend either directly or indirectly from amended claim 33, the rejection of claims 34-42 is also unsupported by the art and should be withdrawn.

Additionally, as noted above, the rejection of amended claim 43 is unsupported by the art. Therefore, amended claim 43 negates a prima facie showing of obviousness with

respect to the cited combination of references. Accordingly, claim 47, which indirectly depends from amended claim 43, is patentably distinguishable over the cited combination of references.

Still further, in distinction to the cited combination of references, amended claim 50 recites "(a) method ... comprising the steps of: providing a stage that retains the device; moving the stage with a stage mover assembly; and measuring the position of the stage with a measurement system, the measurement system comprising a beam source that directs a beam at the stage and a shield positioned near at least a portion of the stage mover assembly and adjacent to a path of the beam so that the shield inhibits environmental conditions from influencing the beam."

Because the cited combination of references do not teach or suggest all of the elements of amended claim 50, the § 103(a) rejection is unsupported by the art and should be withdrawn. Further, because claims 51-54 depend directly from amended claim 50, the rejection of claims 51-54 is also unsupported by the art and should be withdrawn.

Conclusion

In conclusion, the Applicants respectfully assert that claims 1-6, 8-19 and 21-61 are patentable for the reasons set forth above, and that the application is now in a condition for allowance. Accordingly, an early notice of allowance is respectfully requested. The Examiner is requested to call the undersigned at 858-456-1951 for any reason that would advance the instant application to issue.

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Respectfully submitted,



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